



Tanta University

Department: Computers and Control Engineering  
(90 Marks)



Faculty of Engineering

Course Title: Database Systems  
Date: 12/1/2017(First term)

Course Code: CCE3112 3rd Year  
Allowed Time: 3 Hours

**Question No. 1.** (12 points) Choose the correct answer.

- (a) The DBMS acts as an interface between what two components of an enterprise-class database system?
- ☐ Database application and the database      ☐ The user and the database application  
☐ Data and the database      ☐ Database application and SQL
- (b) A foreign key is:
- ☐ used to define data types.      ☐ used to define null status.  
☐ a column containing the primary key of another table.      ☐ all of the above are above correct.
- (c) Which of the following database activities allow for the actual retrieval and use of a database?
- ☐ Enterprise modeling      ☐ Physical database design and definition  
☐ Logical database design      ☒ Database implementation
- (d) The three-schema components include all, but:
- ☐ internal schema.      ☐ programming schema.  
☐ conceptual schema.      ☐ external schema.
- (e) The first step in database development is which of the following?
- ☐ Enterprise data modeling      ☐ Physical database design and definition  
☐ Logical database design      ☐ Database Implementation
- (f) User views are included as part of which schema?
- ☐ Internal      ☐ External  
☐ Conceptual      ☒ None of the above.
- (g) A recursive relationship is a relationship between an entity and
- ☐ a subtype entity      ☒ itself  
☐ an archetype entity      ☐ an instance entity
- (h) Which of the following refers to something that can be identified in the users' work environment, something that the users want to track?
- ☐ Entity      ☐ Identifier  
☐ Attribute      ☐ Relationship

Please go on to the next page ...



(i) Which of the following is **NOT** a basic element of all versions of the E-R model?

- ☐ Entities  
☐ Attributes

- ☐ Relationships  
☒ Primary Keys

(j) When mapping a many-to-many unary relationship into a relation which of the following is true?

- ☐ One relation is created.  
☒ Two relations are created.

- ☐ Three relations are created.  
☐ Four relations are created.

(k) What is **NOT** an advantage of stored procedures?

- ☐ Greater security  
☐ SQL can be optimized

- ☐ Code sharing  
☒ Increased network traffic

(l) A benefit of the three-tier architecture is which of the following?

- ☐ New modules can be built to support specific business needs  
☐ Performance improves for compiled SQL statements

- ☐ Results in a thinner client and database server  
☒ All of the above.

**Question No. 2.** (18 points) You were asked to develop a preliminary ERD for a symphony orchestra. You discovered the following entity types that should be included:

CONCERT SEASON	The season during which a series of concerts will be performed. Identifier is Opening Date, which includes Month, Day, and Year.
CONCERT	A given performance of one or more compositions. Identifier is Concert Number. Another important attribute is Concert Date, which consists of the following: Month, Day, Year, and Time. Each concert typically has more than one concert date.
COMPOSITION	Compositions to be performed at each concert. Identifier is Composition ID, which consists of the following: Composer Name and Composition Name. Another attribute is Movement ID, which consists of two parts: Movement Number and Movement Name. Many, but not all, compositions have multiple movements.
CONDUCTOR	Person who will conduct the concert. Identifier is Conductor ID. Another attribute is Conductor Name.
SOLOIST	Solo artist who performs a given composition on a particular concert. Identifier is Soloist ID. Another attribute is Soloist Name.

During further discussions you discover the following:

- A concert season schedules one or more concerts. A particular concert is scheduled for only one concert season.
- A concert includes the performance of one or more compositions. A composition may be performed at one or more concerts or may not be performed.



- For each concert there is one conductor. A conductor may conduct any number of concerts or may not conduct any concerts.
  - Each composition may require one or more soloists or may not require a soloist. A soloist may perform one or more compositions at a given concert or may not perform any composition. The symphony orchestra wishes to record the date when a soloist last performed a given composition (Date Last Performed).
- (a) (12 points) Draw an ERD to represent what you have discovered.
- (b) (6 points) Identify two business rules in this description and explain how they are modeled on the E-R diagram.

**Question No. 3.** (20 points) Draw an EER diagram for the following situation: Entertainment company owns a chain of theaters. The owners want a database to track what is playing or has played on each screen in each theater of their chain at different times of the day.

- A theater (identified by a Theater ID and described by a theater name and location) contains one or more screens for viewing various movies. T → Scr
- Within each theater each screen is identified by its number and is described by the seating capacity for viewing the screen.
- Movies are scheduled for showing in time slots each day.
- Each screen can have different time slots on different days (i.e., not all screens in the same theater have movies starting at the same time, and even on different days the same movie may play at different times on the same screen).
- For each time slot, the owners also want to know the end time of the time slot (assume all slots end on the same day the slot begins), attendance during that time slot, and the price charged for attendance in that time slot.
- Each movie (which can be either a trailer, feature, or commercial) is identified by a Movie ID and further described by its title, duration, and type (i.e., trailer, feature, or commercial).
- In each time slot, one or more movies are shown.

The owners want to also keep track of in what sequence the movies are shown (e.g., in a time slot there might be two trailers, followed by two commercials, followed by a feature film, and closed with another commercial).

**Question No. 4.** (10 points) Figure 1 shows an EER diagram for Vacation Property Rentals. This organization rents preferred properties in several states. As shown in the figure, there are two basic types of properties: beach properties and mountain properties.

- (a) (6 points) Transform the EER diagram to a set of relations and develop a relational schema.
- (b) (2 points) Diagram the functional dependencies and suggest how to eliminate them.
- (c) (2 points) Suggest an integrity constraint that would ensure that no property is rented twice during the same time interval.



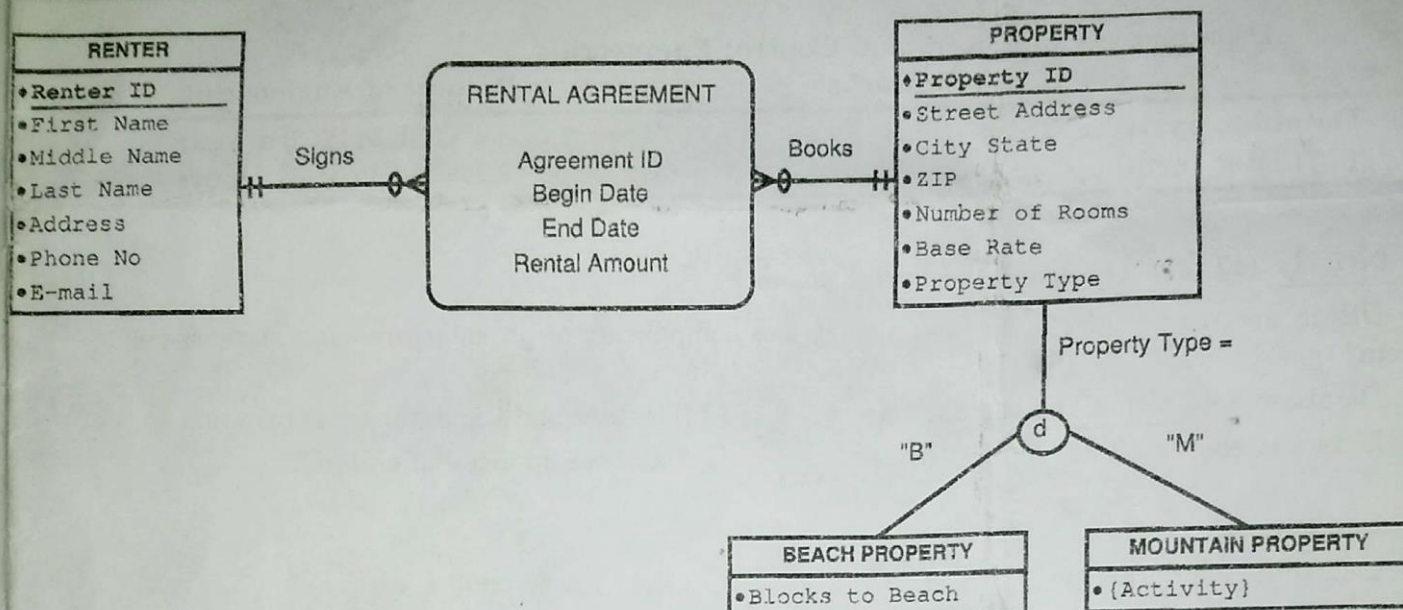


Figure 1: (Q4) EER diagram for Vacation Property Rentals

**Question No. 5.** (10 points) Consider a college application database schema:

- College(cName, state, enrollment)
- Student(sID, sName, GPA, sizeHighSchool)
- Apply(sID, cName, major, decision)

Write the SQL statements that would affect the database as follows.

- (2 points) Create Apply table with constraints.
- (2 points) Add 'Carnegie Mellon' college, located in 'PA', and its enrollments equals 11500.
- (2 points) Include the year of college establishment.
- (2 points) Delete colleges with no CS applicants.
- (2 points) Accept everyone.

**Question No. 6.** (20 points) Consider the same database from the previous question. Write SQL Queries to show the following.

- (2 points) IDs, names, and GPAs of students with GPA higher than 3.6.
- (2 points) The IDs of applicants to bio majors (ex: 'Biology', 'Bioengineering', 'Marine biology').
- (3 points) Names and GPAs of students who came from a high school with size less than 1000 applying to 'CS' major at Stanford, and the application decision.
- (3 points) Applicant's information (Student.sID, sName, GPA, Apply.cName, enrollment), sorted by decreasing GPA then by increasing enrollment.
- (3 points) Students who haven't applied anywhere.
- (3 points) Colleges with fewer than 5 applications.
- (4 points) IDs of students who applied to both 'CS' and 'EE'. Each ID should appear only once.